



SOURCE: STORMTREAT™ SYSTEMS, INC

### Other Proprietary BMPs

Other propriety systems may be available for stormwater treatment, such as hydrodynamic type BMPs such as Stormceptor®, Continuous Deflective separation (CDS) units by CDS Technologies and Storm King® by H.I.L. Technology. For use in the water-supply watershed areas, monitoring studies must indicate that the system can meet the TSS removal requirement of 85%. Even where certain BMPs may not be able to meet this requirement alone, many of these technologies could provide excellent pretreatment in a treatment series with another BMP such as a sand filter.

## **3.5 Structural BMP Installation Guidelines**

### *3.5.1 Introduction*

Proper installation of stormwater BMPs and associated devices is crucial in creating a successful BMP. The following sections are provided to give some general guidelines on the installation of BMPs and construction timing.

Where BMPs are constructed to meet City regulations, the City will inspect the BMP to ensure that it is constructed according to plan and is functioning properly before the ownership responsibility is turned over to the property owner. The water-supply watershed (Ch. 30) ordinance and the 1999 stormwater management (Ch. 27) ordinance require that stormwater control facilities be substantially complete, have full design volume, and otherwise functioning properly prior to plat recordation or occupancy permit is granted for the property. The following sections describe specifically what aspects of BMP the City will inspect to approve the installation.

### *3.5.2 Grass Swales, Filter Strips*

### General Installation Guidelines

Rough graded swales and filter strips should be used to convey water during construction. Final grading should be done at the latest stage of construction possible to grade out erosion gulleys and to prevent excessive sediment from depositing within the permanent grass cover.

The drainage area to swales and filter strips should be stabilized (seeded with straw cover) at the same time as the swales and filter strips are.

It is recommended that swales be sodded or lined with erosion resistant temporary matting to allow a dense grass cover to be established. The sod should be securely fastened to the ground to keep them in place.

When check dams are used at the end of filter strips, a channel or swale should be constructed between the filter strip and check dam to route the flow to the spillways. The swale should be sodded or lined with temporary erosion resistant matting to allow a dense vegetation to establish.

Wood check dams should be pressure treated (rot resistant). The wood should be embedded several feet into the sideslopes.

Gravel trenches should be placed at the same time as the final grading of the filter strip is done. This is to prevent the excess sediments that runoff during the construction phase from prematurely filling the voids in the rock.

### Installation Inspections by the City of Greensboro

The City will check to ensure that the BMP is constructed according to design, including proper slopes, dimensions, etc. The City will inspect to ensure that there are no current erosion problems and that the BMP is protected from potential erosion problems, such as use of temporary matting. The City will also inspect to make sure that there is no excessive sediment accumulation within the swale or filter strip.

### *3.5.3 Dry Detention Basins, Wet Detention Ponds*

### General Installation Guidelines

Dry detention basins and wet detention ponds may be used as sedimentation basins during construction as long as the construction sediment is removed and the design volume is restored prior to turning the maintenance responsibilities over to the property owner(s).

If a riser/barrel assembly is used, ensure that the soil is well compacted around the barrel and anti-seep collars (if used) to minimize weak zones and planes that become pathways for excessive seepage.

Riprap pads should not be just “dumped” and spread out at the end of pipe, but rather placed in the ground where the top of the rock is even with the adjacent grade. Geotextile fabric or sand and gravel bedding should be placed under all riprap protection. The filter fabric should be properly secured into the soil according to the manufacturer’s specifications.

When constructing a dam on a stream, the loose material in the stream bed and banks should be removed prior to filling. This loose material can provide a path for excess seepage if not thoroughly cleaned out.

#### Installation Inspections by the City of Greensboro

Once construction on site is complete and areas draining to the pond are stabilized, the City will determine if the pond needs to have sediment removed. If construction sediment accumulation is not accounted for in the plans, dredging will be required when there is noticeable amounts of sediment accumulation on the pond bottom. If construction sediment is accounted for in the plans, dredging will be required when construction sediment levels exceed the design construction sediment allocation.

#### *3.5.4 Stormwater Wetlands*

#### General Installation Guidelines

The wetland should be initially graded approximately 6 inches below the final elevations. Grading should be conducted within acceptable tolerance limits in order to ensure sheet flow, prevent excessive velocities, prevent dead zones, and allow for proper planting depths as designed. It may be necessary to modify the wetland planting plan to correspond with the actual depth zones created in the field.

If the wetland bottom is above the water table elevation it is important to have a very low permeable soil layer for the wetland foundation to prevent the wetland from drying up in between rain events. The soil foundation should be compacted thoroughly at the appropriate moisture content to reduce infiltration. In some instances it may be necessary to install impermeable liners below the wetland area.

To better ensure success of the wetland, it is important that nutrient rich topsoil be added to the excavated wetlands (Schueler, 1992). It may be desirable to “disc up” the ground before adding the topsoil to incorporate the topsoil into the in situ soil. The final grading (use machinery that will not heavily compact topsoil) should be completed to ensure the proper depth zones. After the final grading, temporary ground cover should be established to reduce excessive erosion.

Riprap pads should not be just “dumped” and spread out at the end of pipe, but rather placed in the ground where the top of the rock is even with the adjacent grade. Geotextile fabric or sand and gravel bedding should be placed under all riprap protection. The filter fabric should be properly secured into the soil according to the manufacturer’s specifications.

To get the soils thoroughly saturated, the wetland soils should be inundated for a period of time before the plantings are introduced.

A wetland specialist should be consulted regarding plantings. The construction of the wetland should coincide with the appropriate planting season for the species selected.

It is a general misconception that the plantings will have to be completely inundated to be able to survive. The water levels should gradually be increased to get the plantings accustomed to inundation (Hammer, 1997).

Unstabilized areas of construction sites produce high concentrations of sediment loads even with conventional erosion control practices. Fine grading, adding topsoil, and plantings should not be completed until the drainage area of the wetland has been permanently and completely stabilized. If the wetland is utilized to meet water-supply watershed regulations, the wetland must be **completed in its entirety**, including planting, before the Certificate of Occupancy (C.O.) is issued.

If it is impossible for the site to be stabilized before the C.O. is desired, the wetland must be initially constructed as a wet detention pond. The wet detention pond may later be converted to the wetland after the site has been stabilized.

### Installation Inspections by the City of Greensboro

The City of Greensboro needs to inspect the final grades of the wetland prior to planting and to ensure that all sediment has been cleaned out from the forebay area. The City will again inspect the site after the plantings have been planted prior to the maintenance responsibility being turned over to the property owner.

#### *3.5.5 Bioretention Areas*

### General Installation Guidelines

Sediment transported by stormwater runoff from construction areas will quickly clog the surface of the bioretention cell. **The planting soil material and underdrain system should not be placed until the site has been completely stabilized and paved areas draining to the cell are flushed to remove loose sediment (must be controlled by an erosion control device).**

Once grading of the site is completed, pervious areas within the drainage area should be immediately seeded to allow time for grass to establish before the planting soil material is placed. Pervious areas draining to bioretention areas should be inspected periodically after seeding to ensure that a dense cover is established and that they are not disturbed by construction equipment.

The City strongly recommends that the filter material be placed at the latest stage of construction possible. If the bioretention cell is utilized as a sediment pit during construction, the cell must be completely mucked out before placing the planting soil material and the underdrain system. When the cell has been excavated, it is recommended that the design engineer should inspect the cell to assess the compactability of the underlying soil to ensure that the soil provides a stable foundation for the cell.

A geotextile fabric should be placed between the bottom of the cell and the underdrain system.

The bioretention planting soil is to be placed in one to two foot lifts and loosely compacted (tamp with back hoe). The soil surface should be level to promote uniform ponding.

The plantings for the bioretention area should be installed according to the bioretention landscape plan.

If any surrounding areas are disturbed during the installation of the bioretention cell, the cell must be protected from sedimentation from these areas. One way to protect the cell is to place a temporary silt fence around the cell. The developer is responsible for protecting the bioretention area from runoff from any subsequent construction activities that take place on-site.

Rip rap pads should not be just “dumped” and spread out at the end of pipe, but rather placed in the ground where the top of the rock is even with the adjacent grade. Geotextile fabric or sand and gravel bedding should be placed under all riprap protection. The filter fabric should be properly secured into the soil according to the manufacturer’s specifications.

#### Installation Inspections by the City of Greensboro

The City of Greensboro needs to inspect the site before the filter materials are placed. All land disturbance and site stabilization activities are to be completed before the City inspects the site. After the filter material is placed, the City will test the initial draw down time and performance of the bioretention system.

#### *3.5.6 Sand Filtration Facilities*

##### General Installation Guidelines

Because the sediment in the runoff from construction areas will quickly clog the surface of the sand filter bed, the filter bed and filter underdrain system should not be placed until the site has been completely stabilized and paved areas draining to sand filter are flushed.

Sediment is to be removed from the sedimentation and filtration chambers before placement of the filter material.

The City strongly recommends that the filter material be placed at the latest stage of construction possible. The developer is responsible for protecting the sand filter once the filter is placed from any subsequent construction activities that take place on-site.

The sand bed should be completely level to promote uniform ponding.

#### Installation Inspections by the City of Greensboro

The City of Greensboro is required to inspect the site before the filter material is placed in the chamber. All land disturbance and site stabilization activities are to be completed before the City inspects the site. Once the material is placed, the City will fill the structure with water to allow the City to monitor the filtration rate and draw down time.

#### *3.5.7 Proprietary Stormwater Treatment Facilities*

Follow the manufacturer’s specifications for installing proprietary stormwater BMPs. The City will inspect to ensure that the BMPs are installed according to the specifications and is functioning as designed.